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development which the utility of the exchange system warrants. Partly to meet this want of a handy guide for his own students, Professor Penhallow, now of McGill college, Montreal, prepared a work under the somewhat misleading title, 'Vegetable histology.' This little treatise deals only indirectly with histology. Its real design is to furnish a student, whether working alone or under guidance, with suggestions as to the use of the principal media in which to examine objects, the reagents for detecting the more common contents of cells and for recognizing the chief modifications which the cell-wall undergoes. In this it succeeds. The directions are clear, and sufficiently full to satisfy any beginner.

To meet the same demand among students in his own country, Poulsen of Denmark has published a handbook, which has been received with marked favor. The translations into German and French are widely known as useful laboratory guides. The recent translation into English, by Professor Trelease, has been neatly and carefully done, and embodies various suggestions by the translator, most of which are improvements. The work treats first of the reagents, their preparation, impurities, and employment. To this part is added a useful chapter on the media for mounting, and the safest cements. The directions for using the newer staining-agents are not always so explicit as to leave no room for further questions on the part of the student who is working by himself, but they are full enough to indicate the wide applicability of this group of chemicals. It is interesting to note how important a part staining-processes — which, within the memory of some of us, were wholly relegated to amateurs who desired to make pretty specimens for the sake of exhibiting their skill in manipulation — now play in the most recondite researches as to the behavior of the nucleus, and the growth of the cell-wall. It is doubtful whether these methods are not capable of much wider development.

Part second of Poulsen's book is devoted to the examination of vegetable substances. The

author has included in his work upon this, some substances which might as well have been left out as some which do not find a place; but, as will be seen by a glance at the comprehensive treatises of Ebermeyer and of Husemann and Hilger, the task of selection is not an easy one. Professor Trelease has placed American teachers under obligations by the excellent translation which he has given them.

With a much wider scope, but covering within its range the materials made use of both by Penhallow and by Poulsen, Behrens's work upon the microscope and its use in laboratories of vegetable physiology, is a welcome addition to botanical literature. It is rather fussy in some of its particularities, but even this extreme of minuteness will be useful to many people into whose hands it is likely to fall. The *naïve* honesty of the author is well shown in some of the striking cuts: for instance, a couple of finished slides are delineated with cover-glass and cement and labels all in place; but the cement, instead of being laid on as evenly as an engraver would naturally depict it, has been represented with a charming and comforting irregularity which will be sure to be followed. In this work Behrens has given exhaustive details as to the selection and employment of all the appliances required in the histological laboratory, and has, for the most part, expressed his critical views with clearness and decision. The references to the literature of the subject are very copious. It is to be earnestly hoped that the announcement is true that the book is soon to be translated into English by a competent person, who has evinced much enthusiasm in microscopical matters. In such a translation it might be well to incorporate a part of the material which was intrusted to the more ephemeral microscopical journals, and which, useful at the time, is in danger of being lost. And such a translation would, doubtless, give less prominence to a few of the excerpts which Behrens himself has made from such journals.

INTELLIGENCE FROM AMERICAN SCIENTIFIC STATIONS.

GOVERNMENT ORGANIZATIONS.

U. S. geological survey.

Work in West Virginia. — The wisdom of the general government in lending its aid to the development of the wealth and natural resources of the

country is nowhere, perhaps, better illustrated than in the work being carried on by the survey in that portion of the Alleghany coal-field that lies between the Great Kanawha and Chattarawha (or Big Sandy) Rivers in West Virginia. Topographical work in this section has been in charge of Mr. W. A. Shumway.

The necessity of preliminary topographical work needs no proof; for it is a self-evident proposition, that without the aid of correct maps, defining the mountains and ridges within which are embraced the main geological features of the country, the geologist, however well versed he may be, is likely to be led into error. The more complicated the geological structure, the greater the degree of accuracy required in the geographical work.

A glance at any of the existing maps of the United States will show that this southern part of West Virginia is about as destitute of railroad communication as any other district of the same area east of the Mississippi River, if not more so.

The peculiar topography of the Appalachians caused engineers to look suspiciously on attempts to cross its ridges at right angles to the axes of uplift, and for a long time retarded the development of this region. Thus unprovided with transportation facilities, the country itself was naturally but sparsely populated, and of itself unable to construct the means of communication with the great tides of commerce passing to the north and south. Another factor retarding the development of the region has its origin in the vexatious litigations concerning titles and the ownership of West-Virginia lands, which are due largely to the indefiniteness of former survey-lines, run independently and without connection with each other. This state of affairs will, in large part, be remedied by the work of the geological survey.

The completion of the Baltimore and Ohio, and the Chesapeake and Ohio railroads demonstrated the possibility of practical and feasible routes through the supposed barrier of the Alleghanies, and has partially developed one of the most valuable coal areas within the limits of the United States. It now remains to construct lateral branches, and to make a comprehensive and detailed geological investigation of what promises to be one of the most interesting mining and manufacturing regions of the country. Mr. Shumway, in 1883, surveyed between four thousand and five thousand square miles of this section, comprising the counties of Wayne, Boone, Logan, Wyoming, Mercer, Raleigh, Lincoln, and portions of Cabell, Fayette, Kanawha, and Summers. The office of the completed map is to supply the geodetic features for the establishment of the true position of the geological formations, and to serve as a basis for a subsequent elaborate and exhaustive geological study of the included region. Like all the older states settled previous to the adoption by the government of the present rectilinear surveys, West Virginia has been forced to rely, for her geological mapping, upon such field-work as very meagre state appropriations allowed. The work accomplished was consequently of a very fugitive nature; and, because of the absence of any connected system of land-surveys over the state, the existing published maps have no claim to faithfulness in the delineation of the geographical features of the country, much less to accuracy in the portrayal of the surface configuration.

It is true that innumerable land-traverses cross and recross the country in a perfect network of lines,

some being run with more or less respectful regard to nature, but the greater number being surveyed by engineers solely in the interests of the land-owners. In the few instances which have a plausible claim to accuracy, the variations of the magnetic meridian, differing by no inconsiderable amount in contiguous tracts of land, and resulting often from the presence of iron oxide beneath the surface, precludes the possibility of accepting these disjointed meanders as furnishing reliable and correct geographical data for use as a basis for scientific work.

The difficulties met with in mapping the area under consideration are those common to the work in the southern Appalachian Mountains, where dense forests, and the absence of a sufficient number of commanding points well situated for triangulation stations, offer obstacles to the topographer which make the most constant demand on his experience and judgment, and, at the same time, call for the most extravagant outlay from his stock of patience and good nature. It is doubtful if, within the limits of the United States, there exists another section of country in geological structure so simple, yet for topographical work so replete with obstacles and difficulties, as this coal-region of West Virginia. It is simply bestowing credit where it rightfully belongs, to state that the forthcoming map is mainly the result of the experience and able judgment, in geographical work, of Mr. Henry Gannett, the chief geographer of the survey, who supervised the work in this area.

The character of the topography here, as in all regions, is derived from, and varies with, the nature of the geologic formations. The most casual study of the stratigraphy of the district evidences the fact that the entire country, now underlain by the coal-formation, at one time constituted a vast basin or geosynclinal. After a long period of oscillations, producing a series of emergences and submergences, during which the succession of coal-beds and interstratified sands, clays, etc., were formed, at or near the close of paleozoic time, there occurred an epoch of disturbance which resulted in the general elevation of the Appalachian region, and produced the numerous ridges, faults, and displacements of the Alleghanies. As might naturally be inferred, the greater the distance from the centre of disturbance, the less prominent were the effects, until reaching the axial line of the Flat-Top and White-Oak Mountains. We find that from here, westward to the Ohio River, the entire country seems to have been elevated in one mass, hinging on that river, and having a gradual slope to the north-west, which is the direction of the prevailing dip. The development of faults relieved in a large measure the strata lying to the westward; and the presence of the massive sandstone in the conglomerate series, also, no doubt, aided in preventing the flexures extending to the west.

This region may therefore be regarded as an eroded plateau, sloping from the east toward the Ohio: so that, to the west of the axial line just referred to, the rocks dip faster than the plane of erosion, and we pass necessarily into higher and higher strata of the coal-formation; that is, the highest strata in geo-

logical position occupy the lowest place geographically. The general plane of the country is determined by the upper surface of the conglomerate series, which continues to rise from the west, until, in the mountains already mentioned, it attains an elevation ranging between thirty-two hundred and thirty-five hundred feet. The Raleigh plateau-region owes its existence to the presence of the conglomerate series.

The comparatively incoherent strata of the carboniferous above the conglomerate sandstones were quickly eroded away. When the upper surface of the hard conglomerates was reached, the degradation of the surface in a measure ceased, and the mechanical action of the streams was concentrated in deepening and widening their channels. This has produced the cañon-like features so characteristic of the New-River district.

The lateral wear in most cases was necessarily slight. The marshes of Coal River form, however, a singular exception to the general topographical features; as in this case the erosion, acting laterally, has resulted in a deep and rather broad valley. The conglomerate series, with its slope to the north-west, passes beneath the lower coal-measures near the embouchure of Gauley River, which, in turn, sink beneath the water-level a short distance west of Charlestown. The lower barrens, which overlie them still farther west, pass beneath the upper coal-measures.

The cañon-like features of the valleys are gradually lost as we go westward from the Kanawha Falls; and the hills become lower and lower, until, when the Ohio is reached, they do not rise more than two hundred feet above the river.

With the exception of the gradual difference in elevation due to the general rise in the country from the Ohio eastward, the surrounding knobs appear on one and the same level, and offer the most indisputable evidence of the plateau nature of the entire country; the mountains being simply the uneroded remnants of higher strata, resting on the basal plane of the conglomerate series.

It is this character of the country, in which there are few salient points well located for suitable sta-

tions for instrumental work, that retards topographical work, and renders impracticable the application of methods that are elsewhere best adapted to effect the most economic and accurate results.

The primary triangulation extending over this section connects at the north and south with the triangulation work of the U. S. coast and geodetic survey, while the lines of the secondary work establish geographical positions throughout the entire area included between the Kanawha and Chattarawha Rivers. With these numerous geodetically determined positions, it was found possible, by judicious adjustment, to utilize a large amount of existing material, sufficiently accurate in point of drainage detail, but heretofore valueless as a means of absolute location.

The completed map, as prepared for publication, will be upon a scale of 1: 250,000, or approximately four miles to one inch, in approximate contour lines having a vertical interval of two hundred feet. When draughted, and made continuous with the government surveys extending throughout the whole southern Appalachian region, it will serve as a basis for subsequent geologic investigation in the field.

The field of work included in these surveys has long since been recognized as a most important one; and nowhere more than in the coal-measures of West Virginia is there a greater need for most concise and accurate geological and geographical knowledge, for nowhere can be found circumstances so favorable for the advantageous employment of capital.

Geological survey of Canada.

New-Brunswick division. — Work in this province will be resumed in May, under the direction of Prof. L. W. Bailey, and will be carried on in portions of Carleton and Victoria counties with a view to the preparation of an additional sheet of the general geological map of the province, of which about eight sheets have been already issued. A series of observations on the superficial geology will be simultaneously but independently undertaken by Mr. R. Chalmers.

RECENT PROCEEDINGS OF SCIENTIFIC SOCIETIES.

Boston society of natural history.

May 7. — Mr. F. W. Putnam spoke of an interesting find by Dr. C. C. Abbott, who has made such important discoveries in the Trenton gravels of the Delaware-river valley, and who was the first to prove that man existed on the eastern coast of America at the time a large part of the country was covered with ice, or during the glacial period. The recent discovery was that of a portion of the right side of a human under jaw, which was found sixteen feet below the surface, in the gravel at the railroad cut near the Trenton (New Jersey) depot. In this same deposit, and a few feet above the jaw, Dr. Abbott had

previously found a human tooth, and many stone implements of a rude type. The fragment of human jaw was exhibited, and is shown to be worn and ground in the same way as the pebbles above and about it. Mr. Putnam was on the spot a few days after the jaw had been discovered (on April 18) by Dr. Abbott, and identified the gravel and sand matrix in which the jaw is enclosed, with the material in place. Near and in the gravel above this jaw was found, a few years since, the tusk of a mastodon.

Anthropological society, Washington.

May 6. — Mr. O. Dorsey gave a classification of the Siouan tribes, including the Sioux proper, Assine-